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Effect of Ladder Training Versus Plyometric Training on Agility and Speed among Male Recreational Cricket Players - An Experimental Study

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ABSTRACT

Background: Cricket is a sport that is played all over the world and one should have skills in batting, bowling and fielding (1).Players need fitness such as agility and co- ordination, speed to minimize the injuries and musculoskeletal pains. Agility, is essential for in fielders in cricket since they are positioned closer to the batsmen and have less time to react.speed plays a crucial role in gaining a competitive edge. Faster speed generation enables batsmen to score more singles and fielders to save crucial runs.

Methods: This study adopts a two group pretest ,post-test design over a period of 8 weeks .The study is conducted at the SPMCW ground within the SVIMS setting ,with sample collecting encompassing participants from various colleges namely college of physiotherapy ,college of nursing ,college of allied health sciences and SV physical education .Ethical approval was obtained from the institution ethics committee(IEC) of SVIMS university (IEC No:1668,Date:24/06/2024).The sample size is determined as 30 participants ,selected through a simple random sampling method.

Results: The p- values from the two tailed tests are extremely small *P VALUE: P=0.000*, indicating high levels of significance for all measures. These results collectively suggests that the ladder training and plyometric training had a substantial impact on the subjects agility and speed.

Conclusions: Study concludes that ladder training was more effective than plyometric training in improving agility & speed in cricket players.

Keywords: Cricket players, agility, speed, ladder training, plyometric training

Background

Cricket is a sport that is played all over the world and one should have skills in batting, bowling and fielding (1). Cricket is the one of the most popular games in India played by men and women.(2). Significant or match time-loss injuries are defined as those that either prevent a player from being fully available for selection for a major match, cause a player unable to bat, bowl, or keep wicket when required by either the rules or the team's captain (3).Players need fitness such as agility and co- ordination, speed to minimize the injuries and musculoskeletal pains. Agility, similar to flexibility, is essential for in fielders in cricket since they are positioned closer to the batsmen and have less time to react. In contrast, outfielders need a strong throwing arm to return the ball to the infield effectively (4). Agility can be defined by the ability to explosively start, decelerate, change direction and accelerate again quickly while maintaining body control and minimizing a reduction in speed These are the basic elements of technical skills used to perform motor tasks spanning the power spectrum from dynamic gross activities to fine motor control tasks and include adaptive ability, balance, combinatory ability, differentiation, orientation, reactivation and rhythm (5).

In cricket, speed plays a crucial role in gaining a competitive edge. Faster speed generation enables batsmen to score more singles and fielders to save crucial runs. One effective way to enhance speed is through speed ladder drills, which are beneficial for athletes across various sports. These drills improve speed, agility, explosive leg strength, and aerobic capacity, making them an essential addition to any training program."(6).Speed is the combination of the three elements, namely reaction time, the frequency of movement per unit time, the speed of a certain distance (7). Plyometrics are training techniques used by athletes in all types of sports to increase strength and explosiveness usually involving stopping, starting and changing directions in an explosive manner. These movements are components that can assist in developing agility and can contribute to improvements in speed, agility which are important skills in cricket (8,9). Plyometrics are a type of exercises which utilize the stretch shortening cycle of musculotendinous tissue

(10).Plyometric training improves agility, stability, balance, speed as players aid to increase speed strength ratio which generates more force during quick start & faster propelling off ground (11).. Ladders can be used for variety of purposes; the two most obvious purposes are increased foot speed and coordination (12). Ladder drill training sessions are engaging when they are carried out rhythmically since this teaches the body and mind how to coordinate different foot movements (13). In recent studies there are some evidences on ladder training and plyometric training showing significant effect towards agility and speed among players of soccer ball, basketball. A study of ladder and plyometric training has been done on cricket players (male children).

MATERIALS AND METHODOLOGY MATERIALS

Materials used are listed below: Stop-Watch, Pen, Cones, Tape, Flat non-slip surface, weighing machine stadiometer, Agility ladder.

METHODOLGY

Type of the study: pre and post-test experimental design
Study duration: 8 weeks
Sample collection: SVIMS
Sampling method: convenient sampling
Sample size: 30

INCLUSION CRITERIA

1. Male recreational Cricket players
2. Aged between 18 -26 years
3. Subjects with BMI of 18.5 to 24.9
4. Subjects who gave informed consents

EXCLUSION CRITERIA

1. Subjects with the history of musculoskeletal.
2. Subjects with neurological involvement.
3. Subjects with breathing disorders

STUDY PROCEDURE: This study was started after obtaining ethical clearance (IEC No: 1668, Date:24/06/2024). 30 male recreational cricket players, who met the inclusion criteria, were recruited for the study. After explaining the procedure of the study in detail, written informed consents were obtained from them. Baseline measurements of agility, speed of all players will be measured and recorded as pre-test data. Subjects were divided into 2 groups as ladder training plyometric training. And were given training for 8 weeks. Then after the training program, measurements of agility and speed will be recorded as post test data.

OUTCOME MEASURES:

1. T-test for agility
2. 30-metre sprint test for speed

***2.5.1* Agility t -test**: The subjects were asked to start at cone A. On the command of the timer, the subjects sprints to cone B and touches the base of the cone with their right hand. They, then turn left and shuffle sideways to cone C, also touches its base, this time with their left hand.

Then shuffling sideways to the right to cone D and touching the base with the right hand. They then shuffle back to cone B touching with the left hand and run backwards to cone A. The stopwatch is stopped as they pass cone A.

***2.5.2* 30 –meter sprint test:** The test involves running a single maximum sprint over 30 meters, with the time recorded. After thorough warm up, including some practice starts and accelerations. Subject was asked to start from a stationary position, with one foot in front of the other.

The front foot must be on or behind the starting line. This starting position should was held for 2 seconds prior to starting, and no rocking movements are allowed. Hints were providing for maximizing speed (such as keeping low, driving hard with the arms and legs) and encouraged them to continue running hard through the finish line.

STUDY PROTOCOL

2.6.1 Ladder training

Warm up -jogging and static stretches of major lower musculature for 10 minutes.

The following exercises were performed 6 sets with 3 repetitions followed by 30 seconds rest between each set as a ladder training.

1. Icky shuffle
2. In -out shuffle
3. Side right in
4. Side left in
5. Hopscotch
6. Snake jump

Cool down for 5 minutes

Including warmup and cool down total protocol time for each session lasted for 40minutes.

3 sessions were conducted in one week for period of 8 weeks.

***2.6.2* Plyometric training:**

Warm up -jogging and static stretches of major lower musculature for 10minutes.

The following exercises can be performed for 2 sets with 15 repetitions followed by 30 sec rest between each set.

1. Side to side ankle hops low intensity
2. Standing jump and reach low intensity
3. Front cone hops low intensity
4. Diagonal cone hops low intensity
5. Double leg hops medium intensity
6. Lateral cone hops medium intensity

Cool down for 5 minutes

Including warmup and cool down total protocol time for each session last for 40 minutes.

3 sessions are conducted in one week for period of 8 weeks.

STATISTICAL ANALYSIS AND RESULTS

3.1Statistical analysis:

The statistical analysis was performed using the “SPSS 20.0 version software.

The data was first entered into a Microsoft Excel spreadsheet, tabulated, and then subjected to statistical analysis.

All the descriptive statistical data were presented in the form of mean and standard deviation and graphically represented.

All 30 participants completed the study protocol within eight weeks of training sessions. Since the sample was normally distributed, the Paired t- test was performed within the groups to compare the pre and post values in order to assess the training efficacy. Independent t test was performed between the groups to compare the pre and post values in order to assess the training efficacy.

For all statistical analyses, $P < 0.05$ is considered as significant.

RESULTS

***3.2.1* Data collection**

Baseline evaluation was done for the subjects in ladder training and plyometric training group by using the agility T test and 30 metres sprint test. Subjects have undergone the intervention for 8 weeks and post-test evaluation was done by using the above measures and documented the findings.

Table 1: Comparison of demographic variables between ladder training and plyometric training groups

VARIABLES	GROUP -A	GROUP-B
Mean age: years	21.00±1.92	22.93±2.12
Height	159.20±7.5	160.13±7.0
Weight	59.20±6.9	67.93±26.4
BMI	23.23±1.09	23.8±1.00

In ladder training group, the mean age of the subjects was 21±1.92, while in plyometric training group , the mean age were 22.93±2.12.

In ladder training, the mean height of the subjects was 159.20±7.5, while in plyometric training group , the mean height was 160.13±7.0.

LADDER TRAINING		**Mean**	**SD**	**t-value**	***P-VALUE***
Agility T test	**Pre**	13.28	1.3	17.0 **(TV=1.761)**	0.00
	Post	9.84	1.19		
	Mean difference	3.44			
30 metres sprint test	**Pre**	5.52	0.32	14.0 **(TV=1.761)**	0.00
	Post	3.85	0.37		
	Mean difference	1.67			

In ladder training group , the mean weight of the subjects was 59.20±6.9, while in plyometric training group , the mean weight was 67.93±26.4.

In ladder training group , the mean BMI of the subjects was 23.23±1.09, while in plyometric training group , the mean BMI was 23.8±1.00.

Table 2: Within group analysis among subjects of ladder training pre and post-test values of agility t test and 30 sprint test.

Interpretation:
In ladder training the pre- and post-mean of agility t test was 13.28 and 9.84 with mean difference 3.44, t -value 17.0, *P VALUE 0.00* respectively .

And the pre and post value of 30 metres sprint test were 5.52 and 3.85 with mean difference 1.67, t -value 14.0, *P VALUE 0.00.*

Table- 3: Within Group Analysis Among Subjects Of Plyometric Training Pre And Post-Test Values Of Agility T-Test And 30 Metres Sprint Test.

PLYOMETRIC TRAINING		**Mean**	**SD**	**t-value**	***P-VALUE***
Agility t test	**Pre**	13.48	1.41	9.4 **(TV=1.76)**	0.00
	Post	11.9	1.1		
	Mean difference	1.51			
30metres sprint test	**Pre**	5.46	0.47	14.5 **(TV=1.76)**	0.00
	post	4.31	0.33		
	Mean difference	1.14			

Interpretation:

In plyometric training the pre- and post-mean of agility t test was 13.48 and 11.9 with mean difference 1.51, t -value 9.4, *P VALUE 0.00* respectively.

And the pre and post value of 30 metres sprint test were 5.46and 4.31with mean difference 1.14, t -value 14.5, *P VALUE0.00.*
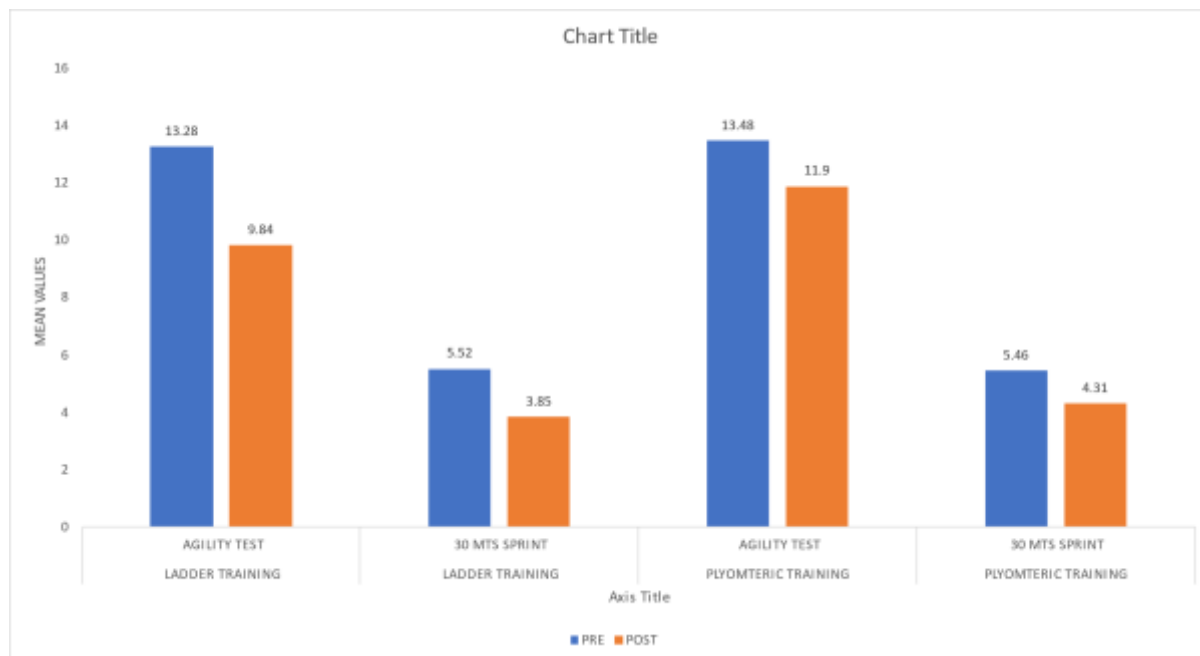
Figure : Graphical Representation Of Agility T Test And 30 Metres Sprint Test Within The Groups.

Results: The study sample comprised 30 subjects all underwent training.

15 subjects were under ladder training, whereas 15 subjects were given plyometric training. The pre and post-test values were noted by agility t test and 30 metres sprint test.

With respect to baseline values of both groups' agility t test and 30 metres sprint test were homogenous.

In ladder training the pre- and post-mean of agility t test was 13.28 and 9.84 with mean difference 3.44. And the pre and post value of 30 metres sprint test were 5.52 and 3.85 with mean difference 1.67. As both measured the calculated values(n-1=14) were 17.0,14.032 at DF 14, tabulated value 1.76. Calculated value > than tabulated value were obtained. Hence null hypothesis was rejected and alternate hypothesis was accepted. In plyometric training the pre- and post-mean of agility t test was 13.48 and 11.9 with mean difference 1.51 respectively. And the pre and post value of 30 metres sprint test were 5.46 and 4.31with mean difference. As both measured the calculated values(n-1=14) were 9.425,14.502 at DF 14. Calculated value is >tabulated value. Therefore, null hypothesis was rejected and alternate hypothesis was accepted. Before the intervention, no significant differences was found in agility t test and 30 metres sprint test scores between ladder training and plyometric training *(P =0.695, P=0.6)* After the intervention of agility and speed both groups showed significant improvements *(P =0.00), (P=0.001*), ladder training showing greater improvement with mean difference 2.12, 0.46 than plyometric training.

DISCUSSION

Rangga Ardian Pradana et al. studied 25 male basketball players. The study was conducted for 6 weeks with 16 times of training. The result found there was influence of ladder drill training toward agility level with significant value of p=0.001(16). Similar results were found in this study from table no :2 showing improvement of agility after ladder training (pre 13.28 and post 9.84).

N Chandrakumar et al. studied 30 men sports club badminton players and they were equally divided in to three groups of ten each as experimental group-I, experimental group-II and control group. Group-I underwent ladder drill and group-II underwent SAQ training. This study concluded that the ladder drill and SAQ training were significantly

improved the speed and agility among sports clubs badminton players. Similar results were found in this study from table no :2 showing improvement of speed after ladder training (pre 5.52 and post 3.85).

Babar Bashir et al. taken 30 male cricket players and they were randomly assigned in plyometric (n=15) and resistance (n=15) groups. Both groups performed for 8 weeks. Between-groups comparison showed better records in agility, speed and explosive power for plyometric compared with resistance training group after eight weeks (respectively p=0.032, p=0.0001 and p=0.002). Plyometric exercises also showed more favourable effects on study variables compared with resistance exercises (16). Similar results were found in this study from table no:3 showing improvement of agility and speed after plyometric training (pre 13.48 and post 11.9) and 30 metres sprint test(pre 5.46and post 4.31).

Vidhi R. Dave et al. studied 38 male cricket players (under -19) randomly allocated into two equal groups ladder training group and plyometric training group. Both the groups carried out 10 minutes warm up & 10 minutes cool down exercises, 20 minutes of ladder training or plyometric training respectively. In ladder training group pre mean value of agility was 13.8± 1.39 and post mean value 11.25± 1.34 where P<0.0001 and pre mean value of speed was 10.53± 1.20 and post mean value 8.97± 0.95 where p< 0.0001. Study concludes that ladder training was more effective than plyometric training in improving agility & speed in cricket players(4). P. Mahesh studied the effects of ladder and plyometric training on agility among cricket players. The subjects were separated into three equal groups. Group-I performed ladder training, group-II performed plyometric training and group-III was control. The subjects were involved for a period of six weeks. The ladder training and plyometric group produced significant improvement in agility (10).

Muhammad Labib Siena Ar Rasyid et al. done a study on 36 trained male students, and they were divided into three groups, namely TR (tuck jump-double leg run), SH (squat jump- double leg hop), and C (conventional exercise). Each group consists of twelve students doing treatment with a frequency of three days a week for six weeks. The research instruments used were the 30-meter sprint, agility T-test, and Jump MD. The results showed significant differences in the three groups' increasing speed, agility, and leg muscle power simultaneously. The post hoc test showed that the TR and SH groups differed significantly from the C group. This study concluded that combining plyometric training and ladder drills significantly impacts increasing leg speed, agility, and muscle power (24).

Overall, the evidence presented in this research supports the ladder training and plyometric training holds promise as an effective method to enhance agility and speed among recreational male cricket players. And also ladder training showing greater improvement with mean difference 2.12, 0.46 than plyometric training.

Ladder training may have improved agility for a number of reasons, including the fact that during exercise, the muscle becomes more elastic and improves joint mobility which allows leg to swing in the steps and increases joint mobility. In addition to improving muscle extension, muscle flexibility enables stronger and quicker contraction, which speeds up the completion of the steps.

Training that incorporates dynamic balance enhances agility and helps with body control during movements. Agility enhancement is influenced by both the brain's processing of movement and the body's adaptation to training.

Muscle fibre alterations or rapid twitch accelerate the rate of muscle contraction. The muscle fibres increase the pace at which the muscles contract, increasing agility(4).

A number of factors, including an innervation adaptation based on the speed at which motion may excite the muscles and the degree to which the CNS can recruit the muscles, may contribute to ladder training increased speed. The motor cortex, descending cortico spinal tract, golgi tendon organ, and neuromuscular junction are possible sites of neural adaptation that could result in increased neural drive, neural firing rate, or neural synchronization. The motor cortex becomes more active when one learns new motor abilities and strives for maximum force(4).

Through motor learning through ladder training (LT), the agonist and antagonist may become more coordinated, ultimately leading to improved performance. It is possible that LT workouts could have enhanced sprint and change of direction (COD) performance by simulating these motions. In order to accelerate neuronal input, the descending cortico spinal tract myelinates neurons. If information from the motor cortex reaches the targeted muscle faster, the rate of force development (RFD) may rise. As the neuromuscular junction adjusts, the acetylcholine receptors, perimeter length, and overall length of nerve terminal branching all grow. A contraction with greater force and a larger RFD could arise from this adaptation's potential to accelerate and increase neuronal input(4).

The Golgi tendon, tendons, joints, muscle spindles, balance, and body position control are all impacted by plyometric training. Perhaps the neuromuscular changes brought about by plyometric exercises have a positive impact on the muscles, tendons, joints, spindles, Golgi tendon, balance, and body position control, which has improved these athletes'

agility (4). Plyometric training led to speed improvements by affecting muscle length, force, muscle temperature. Plyometric group maybe the increased speed of message transfer from muscle to the nerve centre and vice versa led to better records in speed test(9).

CONCLUSION

Study concludes that ladder training was more effective than plyometric training in improving agility & speed in cricket players. Hence, the alternate hypothesis was accepted and the null hypothesis was rejected.

LIMITATIONS AND RECOMMENDATIONS

6.1 Limitations:
1. Sample size was small
2. Couldn't be generalized to the whole cricket players population
3. Smaller geographical area was covered
4. Smaller age group was taken
5. Only male cricket players were included
6. No long term follow up was taken.

6.2 Recommendations:

1. Large sample size is recommended.

2. These fitness components can be studied in other sports players

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